

*Control Measures:*

Spraying with 0.02 per cent endrin at the rate of 5 litres per mature tree, in the early hours of the night, effectively controls the pest. This application is recommended particularly for trees which are not bearing. For trees bearing fruits, spraying 0.05 per cent DDVP, i.e. 1 ml. of Nuvan 100, mixed in 2 litres of water at the same rate is recommended.

ACKNOWLEDGEMENTS

We are thankful to Dr. R. L. Paliwal, Director (Research), Experiment Station, and Dr. N. K. Anant Rao, Dean, College of Agriculture, U. P. Agricultural University, Pantnagar, as well as the Director and Scientist-in-charge, Central Indian Medicinal Plants Organization, Lucknow for their keen interest in their work. Thanks are also due to Dr. A. P. Kapur, Director, Zoological Survey of India, Calcutta-12, for identifying the beetle.

DEPARTMENT OF ENTOMOLOGY,  
COLLEGE OF AGRICULTURE,  
U. P. A. U., PANTNAGAR.

J. P. SINGH

CENTRAL INDIAN MEDICINAL  
PLANTS ORGANIZATION (CSIR),  
HALDWANI, NAINITAL (U. P.),  
October 15, 1968.

RAJENDRA GUPTA

27. PLIETESIAL SPECIES OF STROBILANTHINAE  
(ACANTHACEAE) IN THE WESTERN GHATS (INDIA)

Biennial or perennial plant species flowering or fruiting only once in their life-cycle are usually termed 'Monocarpic', as for instance, Agave & Yucca. If such monocarpic species form compact communities in a homogenous habitat with a synchronous and mass flowering followed by fruiting and simultaneous termination of life-cycle on a mass scale such species are usually termed as 'Plietesials'.

Various species of bamboos are well known for their gregarious flowering only once at the end of their life-cycle ranging from 40 years or more. A similar plietesial habit characterises certain members of the family Acanthaceae. The term 'plantae plietesiae' was coined by Bremekamp (1944) specially to describe certain species of 'Strobilanthinae' of the Acanthaceae. Clarifying the term, he writes of these

plants as follows: 'A majority of the Strobilanthinae are monocarpic i.e., they flower but once and die when they have ripened their fruits. Several of these are known to grow gregariously, often covering large tracts in the undergrowth of the forest with uniform mantle of foliage and flowering after intervals of several years simultaneously and in profusion. Already at the time of flowering the leaves are shed and during the comparatively long period required for the ripening of the capsules, the naked shoots lend the site a peculiar wintry aspect, and as the forest so long as the plants were in flower was filled with the humming of the bees, it is now the scene of the depredations of the numerous frugivorous birds'. 'As the term "perennial" is usually reserved for polycarpic plants whose aerial parts regularly die down and as there exists apparently no name for monocarpic plants of the kind most often met with in the Strobilanthinae, I have introduced for them in my latin descriptions the term "plantae plietesiae" i.e., plants living several years. As it seems desirable to have also a common name for plants showing this growth form, which in tropical and sub-tropical regions are by no means rare, I propose to call them in future "Plietesials".'

The flowering rhythm' in the plietesial members is set in the following way: the species have a vegetative phase of a fixed number of years, characteristic to individual species. At the end of this phase, the members of a species in a compact community flower simultaneously. This is followed by fruit setting and dispersal of seed. All the plants in the community then perish *en masse*. The seed shed by these plants germinate during the next monsoon and start the vegetative phase, thus completing the cycle.

Some members of the tribe Strobilanthinae are almost endemic in Peninsular India and Ceylon and are extensively distributed in the Western Ghats in India. The available literature, however, presents a very scanty information as regards the life-cycles of individual species of this group. Bremekamp (loc. cit.) states with regard to the flowering periods of these plietesial species, that the available literature is either incomplete or unreliable, particularly in case of genera like *Nilgiri-anthus*.

The Central Bee Research Institute with the help of its regional Agricultural Laboratory, Mahabaleshwar (Maharashtra), has been studying some of the local members of the Strobilanthinae, since 1952. Recently these studies have been extended to its regional stations in Castle Rock (Mysore State) and Nilgiri and Palni (Tamilnadu) areas. All these laboratories are fortunately located in the Western Ghats, where a number of the plietesial Strobilanthinae are endemic. It has been thus possible to record and confirm in successive years the flowering

TABLE  
FLOWERING OF STROBILANTHINAE

Species (flowering Period)	Earlier Reports		Field Observations recorded at this Institute (1952-69)			
	Authors	Flowering Years	Reported Interval	Recorded Mass Flowering	Locations	Recorded mass flowering interval
1. <i>Carvia callosa</i> (August-October)	Talbot (1911), Brem, Cooke (1905), Santapau (1951, 1959), McCann, (1943).	1878, 1881, 1885, 1887, 1891, 1895, 1917, 1918, 1926, 1927, 1928, 1942- 1946, 1944, 1949, 1950-1951, 1959- 1960	6, 7, 8, 9, 10, 7-12 or 15 years.	1952, 1960, 1968	Mahabaleshwar (17° 56' N; 73° 40' E) and Khandala (18° 46' N; 73° 22' E) Castle Rock (15° 24' N; 74° 20' E)	8 years***
2. <i>Thelepaepale ixiocephala</i> Brem. (November- January)	Talbot (1911), Cooke (1905), Santapau (1943, 1951, 1962)	1849, 1852, 1884, 1889, 1896, 1918, 1919, 1920, 1928, 1942-1946, 1944, 1951-1952, 1960,	1, 7, or 8 years.	1952, 1960, 1968	Mahabaleshwar and Khandala.	8 years***
3. <i>Mackenzia in- tegrifolia</i> Brem. (February- March)	Talbot (1911), Cooke (1905), Santapau (1951, 1967)	1866, 1885, 1886, 1887, 1889, 1918, 1919, 1925, 1943, 1944, 1945.	3 or 7 years.	1967 1968	Castle Rock, Khandala	8 years* 8 years*
4. <i>Nilgiritanthus reticulatus</i> Brem. (November- December)	Santapau (1951, 1962)	1892, 1909, 1918, 1920, 1924, 1950, 1958	7 years.	1958	Mahabaleshwar	12 years*
5. <i>Pitheophyllum kuntlianum</i> Nees (August-October)	Gamble (1924), Fyson (1915) Robinson (1935), Santapau (1962)	1826-1934 at 12 year intervals, 1847, 1850, 1851, 1852, 1898, 1910, 1948, 1958	2 or 7-12 years.	1969-1970: ex- pected general peak.	Nitigiri and Palni hills (10° 1'-11° 40' N; 76° 14'-77° 52' E).	12 years* 12 years*
6. <i>Strobilanthes serbiculata</i> Dalz. ex Clarke (October- December)	Talbot (1911, 1949), Santapau (1951)	1888, 1889, 1924, 1 year.	1 year.	1952, 1968	Mahabaleshwar	16 years**

Earlier reported flowering years, which correspond to observed intervals in column 7, are in bold type.

\*First observation of mass flowering in the particular locality, intervals estimated from earlier reports;

\*\*2 serial flowerings observed and 1 interval recorded;

\*\*\*3 serial flowerings observed and 2 intervals confirmed.

rhythms of several of these species. The information from earlier reports by various botanists, augmented by actual field observations made by this Institute from 1952 to 1969 have been summarised in the Table.

It will be seen from the table that in so far as it concerns the Mahabaleshwar Plateau, the intervals between successive flowerings are as indicated above. Though such intervals between successive flowerings of the species seem to be fixed, it appears that the compact communities of the same species may flower about an year earlier or later in different localities, while preserving, at the same time, the fixed intervals as above. For instance, *Carvia callosa* and *Thelepaepale ixiocephala* have flowered in Mahabaleshwar in 1968, but the same species have flowered in 1967 at Castle Rock<sup>1</sup>. This situation possibly explains the earlier reports of flowering of these species during consecutive years in spite of their plietesial habit. In fact Talbot (1911, 1949) does refer to some of the above species as annually flowering.

In the course of his observations on some of the above species distributed in Khandala and Mahabaleshwar, Santapau (1943, 1950, 1951, 1952, 1959, 1960, 1962 and 1967) has inferred that there might not be any fixed rhythm with definite intervals in these species, or when they showed such intervals, the reasons for such flowering behaviour were obscure. He had observed more or less stray flowering of isolated plants in successive years. Quite apart from the stray cases, repeated observations at the Mahabaleshwar Laboratory do suggest a remarkable tendency for general, synchronous, mass flowering at fairly fixed intervals as indicated in the table.

#### ACKNOWLEDGEMENTS

I am grateful to Dr. G. B. Deodikar, Director, Maharashtra Association for the Cultivation of Science Research Institute, Poona-4 and Shri C. V. Thakar, Dy. Director, Central Bee Research Institute, K. & V.I. Commission, Poona-4, for guidance, encouragement and help; to Shri R. P. Phadke and Shri K. K. Kshirsagar of this Institute, for their valuable information and help and to Shri. C. S. Bhambure, Apiculture Institute, Mahabaleshwar, and Shri M. C. Mittal of this Institute for help in the field.

CENTRAL BEE RESEARCH  
INSTITUTE,

839/1 SHIVAJINAGAR,  
POONA-4,

December 18, 1969.

M. C. SURYANARAYANA

<sup>1</sup>Earlier records of flowering which tally with the year 1967 in the 8-year sequence as indicated in the table, were found to be from the same region : North Kanara (Talbot 1911).

## REFERENCES

- BREMEKAMP, C. E. B. (1944): Materials for a Monograph of the Strobilanthinae (Acanthaceae). *Verh. neder. Akad. Wetensch. Afd. Nat. Tweede Sec.* **41** (1): 1-306.
- COOKE, TH. (1905): The Flora of the Bombay Presidency. vol. 2, pp. 442-449. Rep. Govt. of India, Calcutta.
- FYSON, P. F. (1915): The Flora of the Nilgiri and Pulney Hill Tops (above 6,500 ft.). vol. 1, pp. 310-314.
- GAMBLE, J. S. (1924): Flora of the Presidency of Madras. vol. 2, p. 726. Rep. Govt. of India, Calcutta.
- MCCANN, C. (1943): The flowering of *Strobilanthes callosus* Nees. *J. Bombay nat. Hist. Soc.* **44**: 143-144.
- ROBINSON, M. E. (1935): The flowering of *Strobilanthes* in 1934. *ibid.* **38**: 117-122.
- SANTAPAU, H. (1943): The flowering of *Strobilanthes*. *ibid.* **44**: 605-606.
- (1950): The flowering of *Strobilanthes*. *ibid.* **49**: 320-321.
- (1951): The Acanthaceae of Bombay. *Univ. Bombay bot. Mem.* **2**.
- (1952): The flowering of *Strobilanthes* in Khandala. *J. Bombay nat. Hist. Soc.* **50**: 430-431.
- (1959): The flowering of *Strobilanthes*. *ibid.* **56**: 677.
- (1962): Gregarious flowering of *Strobilanthes* and Bamboos. *ibid.* **59**: 688-695.
- (1967): The Flora of Khandala on the Western Ghats of India. *Rec. Bot. Surv. India* **15** (1): 197-199.
- TALBOT, W. A. (1911): Forest Flora of Bombay Presidency and Sind. vol. 2 Govt. of Bombay, Poona.
- (1949): The trees, shrubs and woody climbers of the Bombay Presidency. 3rd edn. Govt. Photographic Press, Poona.

## 28. A NOTE ON THE TOAD RUSH, *JUNCUS BUFONIUS* L. FROM INDIA

(With a plate)

Hooker (1894) described 26 species of the genus *Juncus* from India. Most of them are from alpine and sub-alpine Himalayas and Assam and a few from drier parts of India. *Juncus bufonius* L. has been reported in northern India from the plains to 13,000 ft. in the Himalayas and in the south from Madras (Gamble & Fischer 1956). There is no report of its occurrence in any part of Western India.

The plant was recently collected by my students J. N. Patel, K. S. Sobti and I. A. Patel from the different sites ranging from Sadra to Sarkhej from the saline bed of River Sabarmati (Herbarium sheet numbers 1518 dated March 2, 1970 and 659 dated February 11, 1970). The description and figures will familiarize botanical collectors with its identity.

### *Juncus bufonius* L.

Slender, dwarf, elegant. (Fig. 1) annual with tufts of leafy branched fertile stems from a fibrous root-stock. Flowers markedly pro-  
trandrous, in small cymes (Fig. 2). The partial inflorescence is an